

Claims

1. A method for providing a process model  
for a material in a manufacturing process, including  
5 the steps of:

receiving stress and distortion information  
of the material from a previous manufacturing process;

determining updated stress and distortion  
information of the material from a process model for  
10 the present manufacturing process, the updated stress  
and distortion information being a function of the  
stresses and distortions caused by the present  
manufacturing process and the stresses and distortions  
from the previous manufacturing process; and

15 providing the updated stress and distortion  
information of the material to a subsequent  
manufacturing process.

2. A method, as set forth in claim 1,  
20 wherein the process model is a thermal process model.

3. A method, as set forth in claim 2,  
wherein the stresses and distortions are thermal  
stresses and distortions.

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4. A method, as set forth in claim 3,  
wherein the stresses and distortions include changes  
in dimensions of the material.

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5. A method, as set forth in claim 3, wherein the stresses and distortions include changes in properties of the material.

5 6. A method, as set forth in claim 3, wherein the material is a metal being processed by thermal processes.

7. A method, as set forth in claim 6,  
10 wherein the thermal process is one of a thermal cutting and welding process.

8. A method for providing a process model for a material in a thermal cutting process, including  
15 the steps of:

receiving stress and distortion information of the material from a previous manufacturing process;

determining updated stress and distortion information of the material from a process model for  
20 the thermal cutting process, the updated stress and distortion information being a function of the stresses and distortions caused by the thermal cutting process and the stresses and distortions from the previous manufacturing process; and

25 providing the updated stress and distortion information of the material to a subsequent manufacturing process.

9. A method, as set forth in claim 8,  
wherein the material is a metal being cut by the  
thermal cutting process.

5 10. A method, as set forth in claim 9,  
wherein the previous manufacturing process is one of a  
steel rolling process and a shot blasting process.

10 11. A method, as set forth in claim 9,  
wherein the subsequent manufacturing process is one of  
a bending process and a welding process.

12. A method, as set forth in claim 8,  
wherein determining the updated stress and distortion  
15 information includes the steps of:

receiving residual stress information from  
the previous manufacturing process;

mapping deformations of the material from  
the stress and distortion information received from  
20 the previous manufacturing process;

modeling the thermal stresses caused by  
thermal cutting of the material;

incorporating a set of thermal material laws  
of the material, the thermal material laws defining  
25 properties of the material in a transition state from  
solid to liquid; and

determining a thermal cutting model of the  
stresses and distortions of the material as a function  
of the above steps.

13. A method for providing a process model for a material in a welding process, including the steps of:

receiving stress and distortion information  
5 of the material from a previous manufacturing process;

determining updated stress and distortion  
information of the material from a process model for  
the welding process, the updated stress and distortion  
information being a function of the stresses and  
10 distortions caused by the welding process and the  
stresses and distortions from the previous  
manufacturing process; and

providing the updated stress and distortion  
information of the material to a subsequent  
15 manufacturing process.

14. A method, as set forth in claim 13,  
wherein the material is a metal being welded by the  
welding process.

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15. A method, as set forth in claim 14,  
wherein the previous manufacturing process is one of a  
thermal cutting process and a bending process.

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16. A method, as set forth in claim 14,  
wherein the subsequent manufacturing process is a  
machining process.

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